

Non-Destructive Testing Methods for Cables of Cable Supported Structures – Practical Experiences

Thomas Neteler 1), Hardi Lobert 2)

1 Head of Sales Ropes & Transport, DMT GmbH & Co.KG, Germany

2 Deputy Head DMT Rope Testing Centre, DMT GmbH & Co.KG, Germany

Contact: thomas.neteler@dm-group.com

Abstract

DMT's Rope Testing Centre – a laboratory for non-destructive and destructive testing and part of TÜV NORD GROUP - has long-time experience in the inspection of steel wire ropes and cables in varying applications. DMT provides different non-destructive testing (NDT) methods, which allow a more detailed evaluation of the inner condition of the cables compared to only visual inspection. Ultrasonic testing (UT) at cable end connections is a very effective NDT method which is executed regularly by DMT experts. Another NDT method suitable to inspect the free length of stay or hanger cables is magnetic rope testing (MRT). Starting in 1931 with MRT on steel wire ropes, DMT has since then continuously developed and optimized this testing method and gained extensive operating skills.

Keywords: Magnetic Rope Testing / Ultrasonic Testing / Stay Cables / Hanger Cables

1 Introduction

Cable supported structures have existed for centuries. First concepts for bridges supported by wrought iron chains were e.g. presented in 1823 by French engineer C.L. Navier [3]. Poser even mentions a wooden bridge supported with chain stays built in the early 1600s [15].

Basic types of contemporary bridge cable systems made of steel wires are e.g. described in "Cable-Stayed Bridges: 40 Years of Experience Worldwide" by Svenssen (see figure 1.1 [11]).

Tabelle 1.3 Übersicht über Kabelsysteme

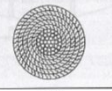
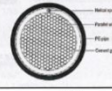

Eigenschaften	Vollverschleiss Seile	Parallelschleiss Seile	Parallelschleiss Seile
			
$E \cdot 10^{-6}$ [N/mm ²]	6,170	6,205	6,195
E_s [N/mm ²]	1470	1470	1470
$\Delta\sigma$ [N/mm ²]	150	200	200

Figure 1.1: Different stay cable constructions [11]

Modern stay cable bridges are often supported by parallel strand cable systems, but existing bridges with other cable systems, like parallel wire cables, full locked coil cables etc. are often in operation for decades.

Cables in cable supported structures are always relevant parts of the load bearing system and relevant for structural safety. They should therefore be subject to regular investigations.

Numerous inspection and monitoring techniques are available, but in many cases very expensive [7]. Access to cables for visual inspections or non-destructive testing (NDT) is often difficult, and in the case of the anchorage zones, often impossible. Applicability of the available methodologies often depends on the given cable construction and anchorage design. Besides visual inspection, non-destructive testing methods like ultrasonic testing (UT, see chapter 2) and magnetic rope testing (MRT, see chapter 3) are among the proven and accepted